COMMON ENTRANCE TEST - 2004

Subject : MATHEMATICS
DATE : 18.05.2004
TIME : 2.30 P.M. TO 3.50 P.M.
MAXIMUM MARKS : 60
MAXIMUM TIME : 80 MINUTES

Please fill your CET No. below				

QUESTION BOOKLET	
VERSION CODE	SERIAL NUMBER
A 1	057185

IMPORTANT INSTRUCTIONS TO CANDIDATES

(Please read the following instructions carefully, before you start answering on the OMR answer sheet)

1. The OMR answer sheet is issued at the start of the examination at 2.15 p.m., the candidate should first enter only Name and CET No. on the OMR answer sheet.

2. After the 2nd bell at 2.30 p.m. the Question Papers will be issued. Now, the candidate should enter the Version Code and Serial Number of question booklet on the OMR answer sheet. But, he shall not remove the staples on the right side of this booklet OR look inside the question booklet OR start answering on the OMR answer sheet until the 3rd bell rings.

   As answer sheets are designed to suit the Optical Mark Reader (OMR) system, special care should be taken to fill those items accurately.

   DO NOT DAMAGE OR MUTILATE THE TIMING, MARKS ON THE OMR ANSWER SHEETS.

3. Remove the staples at the right side to open the question paper booklet only after the 3rd bell at 2.40 p.m.

4. This question booklet contains 60 questions.

5. During the subsequent 70 minutes :
   a) Read each question carefully.
   b) Determine the correct answer from out of the four available choices given under each question.
   c) **Completely darken / shade the relevant circle with a blue or black ink ballpoint pen against the question number on the OMR answer sheet.**

   For example :

   Q. No. 14 : The product of 0.5 x 0.05 is : 1) 0.05 2) 0.005 3) 0.025 4) 0.25

   As the correct answer is option no. 3, the candidate should darken the circle corresponding to option no. 3 completely with a blue or black ink ballpoint pen on the OMR answer sheet, as shown below :

   

6. For each correct answer, one mark will be awarded. For each wrong answer, quarter (1/4) mark will be deducted and if more than one circle is darkened for a given question, one mark will be deducted. **Even a minute unintended dot will also be recognised and recorded by the scanner. Please avoid multiple markings of any kind.**

7. Rough work should be done only on the blank space provided on each page of the question booklet. Rough work should not be done on the OMR answer sheet.

8. Please stop writing when the last bell rings at 3.50 p.m. Hand over the OMR answer paper set to the invigilator, who will separate the top sheet and will retain the same with him and return the bottom sheet replica to you to carry home.

NOTE : The candidate should safely preserve the replica of the OMR answer sheet for a minimum period of one year from the date of Common Entrance Test.

MATHEMATICS

1. If $\frac{Log\,x}{a-b} = \frac{Log\,y}{b-c} = \frac{Log\,z}{c-a}$ then xyz =

   1) 0 2) 1
   3) -1 4) 2

2. The last digit in 7^{300} is .....

   1) 7 2) 9
   3) 1 4) 3

3. How many numbers of 6 digits can be formed from the digits of the number 112233 ?

   1) 30 2) 60
   3) 90 4) 120

4. The number of solutions for the equation $x^2 - 5|x| + 6 = 0$ is .....

   1) 4 2) 3
   3) 2 4) 1

5. 0.5737373 ..... =

   1) $\frac{284}{497}$ 2) $\frac{284}{495}$
   3) $\frac{568}{999}$ 4) $\frac{567}{990}$

(Space for Rough Work)

6. If $ax^2 - y^2 + 4x - y = 0$ represents a pair of lines then a = ...

1) -16 2) 16

3) 4 4) -4

7. What is the equation of the locus of a point which moves such that 4 times its distance from the x - axis is the square of its distance from the origin ?

1) $x^2+y^2-4y=0$ 2) $x^2+y^2-4|y|=0$

3) $x^2+y^2-4x=0$ 4) $x^2+y^2-4|x|=0$

8. Equation of the straight line making equal intercepts on the axes and passing through the point (2, 4) is .....

1) $4x-y-4=0$ 2) $2x+y-8=0$

3) $x+y-6=0$ 4) $x+2y-10=0$

9. If the area of the triangle with vertices $(x, 0)$, $(1,1)$ and $(0,2)$ is 4 square units then a value of x is .....

1) -2 2) -4

3) -6 4) 8

10. $\lim_{\theta \to \frac{\pi}{2}} \frac{\frac{\pi}{2} - \theta}{Cot\ \theta}$ =

1) 0 2) -1

3) 1 4) ∞

(Space for Rough Work)

11. $\lim_{x \to \infty} \left(1 - \frac{4}{x-1}\right)^{3x-1} =$

1) e^{12} 2) e^{-12}

3) e^{4} 4) e^{3}

12. If $A + B + C = 180^0$ then $\sum Tan \frac{A}{2} Tan \frac{B}{2} =$

1) 0 2) 1

3) 2 4) 3

13. In a triangle ABC if $b = 2$, $B = 30^0$ then the area of the circumcircle of triangle ABC in square units is .....

1) π 2) 2π

3) 4π 4) 6π

14. If $Sin\,x + Sin^2 x = 1$ then, $Cos^{12} x + 3Cos^{10} x + 3Cos^8 x + Cos^6 x =$

1) 1 2) 2

3) 3 4) 0

15. If R denotes the set of all real numbers then the function $f : R \to R$ defined by $f(x) = |x|$ is .....

1) one - one only 2) onto only

3) both one-one and onto 4) neither one-one nor onto

(Space for Rough Work)

16. Which of the following is the inverse of the proposition : "If a number is a prime then it is odd" ?

1) If a number is not a prime then it is odd.
2) If a number is not a prime then it is not odd.
3) If a number is not odd then it is not a prime.
4) If a number is odd then it is a prime.

17. $\sim p \wedge q$ is logically equivalent to .....

1) $p \rightarrow q$
2) $q \rightarrow p$
3) $\sim (p \rightarrow q)$
4) $\sim (q \rightarrow p)$

18. What must be the matrix X if $2X + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$?

1) $\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$
2) $\begin{bmatrix} 1 & -3 \\ 2 & -1 \end{bmatrix}$
3) $\begin{bmatrix} 2 & 6 \\ 4 & -2 \end{bmatrix}$
4) $\begin{bmatrix} 2 & -6 \\ 4 & -2 \end{bmatrix}$

19. The value of $\begin{vmatrix} 1 & 1 & 1 \\ bc & ca & ab \\ b+c & c+a & a+b \end{vmatrix}$ is .....

1) 1
2) 0
3) $(a-b)(b-c)(c-a)$
4) $(a+b)(b+c)(c+a)$

20. The value of $\begin{vmatrix} 441 & 442 & 443 \\ 445 & 446 & 447 \\ 449 & 450 & 451 \end{vmatrix}$ is .....

1) $441 \times 446 \times 451$
2) 0
3) -1
4) 1

(Space for Rough Work)

21. Inverse of the matrix $\begin{bmatrix} Cos\,2\theta & -Sin\,2\theta \\ Sin\,2\theta & Cos\,2\theta \end{bmatrix}$ is .....

1) $\begin{bmatrix} Cos\,2\theta & -Sin\,2\theta \\ Sin\,2\theta & Cos\,2\theta \end{bmatrix}$ 2) $\begin{bmatrix} Cos\,2\theta & Sin\,2\theta \\ Sin\,2\theta & -Cos\,2\theta \end{bmatrix}$

3) $\begin{bmatrix} Cos\,2\theta & Sin\,2\theta \\ Sin\,2\theta & Cos\,2\theta \end{bmatrix}$ 4) $\begin{bmatrix} Cos\,2\theta & Sin\,2\theta \\ -Sin\,2\theta & Cos\,2\theta \end{bmatrix}$

22. If $\left|\vec{a}\right| = 3$, $\left|\vec{b}\right| = 4$ then a value of λ for which $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{a} - \lambda\vec{b}$ is .....

1) $\frac{9}{16}$ 2) $\frac{3}{4}$

3) $\frac{3}{2}$ 4) $\frac{4}{3}$

23. $\left(\vec{a}\cdot\hat{i}\right)\hat{i} + \left(\vec{a}\cdot\hat{j}\right)\hat{j} + \left(\vec{a}\cdot\hat{k}\right)\hat{k} =$

1) $\vec{a}$ 2) $2\,\vec{a}$

3) $3\,\vec{a}$ 4) $\vec{0}$

24. The projection of $\vec{a} = 2\hat{i} + 3\hat{j} - 2\hat{k}$ on $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ is

1) $\frac{1}{\sqrt{14}}$ 2) $\frac{2}{\sqrt{14}}$

3) $\sqrt{14}$ 4) $\frac{-2}{\sqrt{14}}$

25. In the group $\{1, 2, 3, 4, 5, 6\}$ under multiplication modulo 7, $2^{-1} \times 4 =$

1) 1 2) 4

3) 2 4) 3

(Space for Rough Work)

26. If Q_1 is the set of all rationals other than 1 with the binary operation $*$ defined by $a * b = a + b - ab$ for all a, b in Q_1 then the identity in Q_1 w.r.t. $*$ is

1) 1 2) 0

3) -1 4) 2

27. Which of the following is true ?

1) The set of all fourth roots of unity is a multiplicative group.

2) The set of all cube roots of unity is an additive group.

3) $(ab)^{-1} = a^{-1}b^{-1}$ for all a, b in any group G.

4) If $(ab)^2 = a^2b^2$ for all a, b in any group G, then the group G is nonabelian.

28. The set of all integral multiples of 5 is a subgroup of

1) The set of all rational numbers under multiplication.

2) The set of all integers under multiplication.

3) The set of all nonzero rational numbers under multiplication.

4) The set of all integers under addition.

29. The circle $x^2 + y^2 - 8x + 4y + 4 = 0$ touches

1) x – axis 2) y – axis

3) both axes 4) neither x – axis nor y – axis

30. The value of k so that $x^2 + y^2 + kx + 4y + 2 = 0$ and $2(x^2 + y^2) - 4x - 3y + k = 0$ cut orthogonally is

1) $\frac{10}{3}$ 2) $\frac{-8}{3}$

3) $\frac{-10}{3}$ 4) $\frac{8}{3}$

(Space for Rough Work)

31. The coaxal system of circles given by $x^2 + y^2 + 2gx + c = 0$ for $c < 0$ represents.

1) intersecting circles
2) non intersecting circles
3) touching circles
4) touching or non intersecting circles

32. The radius of the circle passing through the point (6, 2) and two of whose diameters are $x + y = 6$ and $x + 2y = 4$ is

1) 4
2) 6
3) 20
4) $\sqrt{20}$

33. If (0, 6) and (0, 3) are respectively the vertex and focus of a parabola then its equation is

1) $x^2 + 12y = 72$
2) $x^2 - 12y = 72$
3) $y^2 - 12x = 72$
4) $y^2 + 12x = 72$

34. For the ellipse $25x^2 + 9y^2 - 150x - 90y + 225 = 0$ the eccentricity, e =

1) $\frac{2}{5}$
2) $\frac{3}{5}$
3) $\frac{4}{5}$
4) $\frac{1}{5}$

35. If the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide then the value of b^2 is

1) 1
2) 7
3) 5
4) 9

(Space for Rough Work)

36. The equation of the director circle of the hyperbola $\frac{x^2}{16} - \frac{y^2}{4} = 1$ is given by .....

1) $x^2 + y^2 = 16$ 2) $x^2 + y^2 = 4$

3) $x^2 + y^2 = 20$ 4) $x^2 + y^2 = 12$

37. If $0 \leq x \leq \pi$ and $81^{Sin^2 x} + 81^{Cos^2 x} = 30$ then $x =$

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{2}$

3) $\frac{\pi}{4}$ 4) $\frac{3\pi}{4}$

38. If $Sin^{-1}\frac{x}{5} + Cosec^{-1}\frac{5}{4} = \frac{\pi}{2}$ then $x =$

1) 1 2) 4

3) 3 4) 5

39. If $Cos^{-1} p + Cos^{-1} q + Cos^{-1} r = \pi$ then $p^2 + q^2 + r^2 + 2pqr =$

1) 3 2) 1

3) 2 4) -1

40. The smallest positive integer n for which $(1+i)^{2n} = (1-i)^{2n}$ is

1) 1 2) 2

3) 3 4) 4

(Space for Rough Work)

41. If $x + \frac{1}{x} = 2\,Cos\,\alpha$ then $x^n + \frac{1}{x^n} =$

1) $2^n\,Cos\,\alpha$ 2) $2^n\,Cos\,n\alpha$

3) $2i\,Sin\,n\alpha$ 4) $2Cos\,n\alpha$

42. If $w = \frac{-1+\sqrt{3}\,i}{2}$ then $\left(3 + w + 3w^2\right)^4 =$

1) 16 2) -16

3) $16\,w$ 4) $16w^2$

43. If $f(x) = \begin{cases} \frac{1-Cos\,x}{x} & , x \neq 0 \\ k & , x = 0 \end{cases}$ is continuous at $x = 0$, then $k =$

1) 0 2) $\frac{1}{2}$

3) $\frac{1}{4}$ 4) $-\frac{1}{2}$

44. If $y = Tan^{-1}\left(Sec\,x - Tan\,x\right)$ then $\frac{dy}{dx} =$

1) 2 2) -2

3) $\frac{1}{2}$ 4) $-\frac{1}{2}$

45. The differential coefficient of $f(Sin\,x)$ w.r.t. x where $f(x) = log\,x$ is

1) $Tan\,x$ 2) $Cot\,x$

3) $f(Cos\,x)$ 4) $\frac{1}{x}$

(Space for Rough Work)

46. If $x = a\left(t - \frac{1}{t}\right)$, $y = a\left(t + \frac{1}{t}\right)$ then $\frac{dy}{dx} =$

1) $\frac{y}{x}$ 2) $\frac{-y}{x}$

3) $\frac{x}{y}$ 4) $\frac{-x}{y}$

47. If $x = A\ Cos\ 4t + B\ Sin\ 4t$ then $\frac{d^2x}{dt^2} =$

1) $-16x$ 2) $16x$

3) x 4) $-x$

48. For the curve $y^n = a^{n-1}x$ if the subnormal at any point is a constant then $n =$

1) 1 2) 2

3) -2 4) -1

49. If the distance 's' metres traversed by a particle in 't' seconds is given by $s = t^3 - 3t^2$, then the velocity of the particle when the acceleration is zero, in metres/sec is -

1) 3 2) -2

3) -3 4) 2

50. The maximum of the function $3\ Cos\ x - 4\ Sin\ x$ is

1) 2 2) 3

3) 4 4) 5

(Space for Rough Work)

51. If a tangent to the curve $y = 6x - x^2$ is parallel to the line $4x - 2y - 1 = 0$, then the point of tangency on the curve is

1) (2, 8) 2) (8, 2)
3) (6, –1) 4) (4, 2)

52. $\int \frac{dx}{x^2+2x+2} =$

1) $Sin^{-1}(x+1)+c$ 2) $Sinh^{-1}(x+1)+c$
3) $Tanh^{-1}(x+1)+c$ 4) $Tan^{-1}(x+1)+c$

53. $\int \sqrt{x}\, e^{\sqrt{x}}\, dx =$

1) $2\sqrt{x} - e^{\sqrt{x}} - 4\sqrt{x}\, e^{\sqrt{x}} + c$ 2) $\left(2x - 4\sqrt{x} + 4\right)e^{\sqrt{x}} + c$
3) $\left(2x + 4\sqrt{x} + 4\right)e^{\sqrt{x}} + c$ 4) $\left(1 - 4\sqrt{x}\right)e^{\sqrt{x}} + c$

54. $\int \frac{dx}{x\left(x^7+1\right)} =$

1) $Log\left(\frac{x^7}{x^7+1}\right)+c$ 2) $\frac{1}{7}Log\left(\frac{x^7}{x^7+1}\right)+c$
3) $Log\left(\frac{x^7+1}{x^7}\right)+c$ 4) $\frac{1}{7}Log\left(\frac{x^7+1}{x^7}\right)+c$

55. $\int_{-1}^{1} |1-x|\, dx =$

1) – 2 2) 0
3) 2 4) 4

(Space for Rough Work)

56. $\int_0^{\pi/2} \frac{Cos\,x - Sin\,x}{1+Cos\,x\,Sin\,x}\,dx =$

1) 0 2) $\frac{\pi}{2}$

3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

57. $\int_0^{\pi/8} Cos^3 4\theta\, d\theta =$

1) $\frac{2}{3}$ 2) $\frac{1}{4}$

3) $\frac{1}{3}$ 4) $\frac{1}{6}$

58. The area enclosed between the curves $y = x^3$ and $y = \sqrt{x}$ is, in square units

1) $\frac{5}{3}$ 2) $\frac{5}{4}$

3) $\frac{5}{12}$ 4) $\frac{12}{5}$

59. The degree of the differential equation $\left(1+\left(\frac{dy}{dx}\right)^2\right)^{3/4} = \left(\frac{d^2y}{dx^2}\right)^{1/3}$ is

1) $\frac{1}{3}$ 2) 4

3) 9 4) $\frac{3}{4}$

60. The general solution of the differential equation $\frac{dy}{dx} + \frac{1+Cos\,2y}{1-Cos\,2x} = 0$ is given by

1) $Tan\,y + Cot\,x = c$ 2) $Tan\,y - Cot\,x = c$

3) $Tan\,x - Cot\,y = c$ 4) $Tan\,x + Cot\,y = c$

(Space for Rough Work)

(Space for Rough Work)

A-1